

Evaluating Feasibility of Ultrasound-Guided Insertion of Iliosacral Screws for Pelvic Fracture Fixation

Pierre Guy, MD; Prashant Pandey, PhD; Emily K. Bliven, BSME; Kelly A. Lefavre, MD; Antony Hodgson, PhD

Purpose: Pelvic fractures often require iliosacral screw fixation under fluoroscopic guidance. We propose using an ultrasound-guided surgical navigation system to improve efficiency, reduce radiation exposure, and enhance placement accuracy.

Methods: In our study, we implemented the Navigated Orthopaedic Fixations using Ultrasound System (NOFUSS) and inserted iliosacral screws in 8 human cadavers (4 per specimen, 2 each using fluoroscopy and NOFUSS). Six specimens yielded usable ultrasound images. We evaluated placement accuracy, time, and radiation exposure.

Results: NOFUSS resulted in comparable placement accuracy to fluoroscopy, with median screw entry and midpoint errors of 8.4 mm and 7.0 mm, respectively. However, fluoroscopy had lower angulation errors (4.4° vs 1.4°). NOFUSS had a higher breach rate (50% vs 16.7% $P = 0.19$) but significantly shorter insertion times (7 min 37 sec vs 12 min 36 sec per screw). The median radiation exposure during the fluoroscopic procedure was 2 min 44 sec (range, 1 min 44 sec-3 min 18 sec), with no radiation required for NOFUSS. When considering cadavers with adequate quality ultrasound images, NOFUSS showed promising results, with similar entry errors to fluoroscopy 3.6 mm and 8.1 mm ($P = 0.06$), with 1 vs 2 breaches, respectively ($P > 0.05$) and reduced insertion times.

Conclusion: Our study demonstrates the feasibility of NOFUSS for iliosacral screw insertions, achieving accuracy comparable to fluoroscopy while significantly reducing insertion times and eliminating radiation exposure.

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